

CLAIMS

1. A method for use in a receiver, the method comprising:
processing a received signal with a phase-locked loop (PLL); and
generating a carrier frequency offset estimate as a function of a phase error signal of
5 the PLL.
2. The method of claim 1, wherein the processing step includes the step of setting the PLL in an open loop mode of operation.
- 10 3. The method of claim 2, wherein the generating step includes the steps of:
determining a rollover count value for the phase error signal;
determining a symbol count value of the received signal; and
generating the carrier frequency offset estimate from the determined rollover count
value and determined symbol count value.
- 15 4. The method of claim 3, further comprising the step of detecting a false lock
condition as a function of comparing the carrier frequency offset estimate to a closed loop
value of the PLL.
- 20 5. The method of claim 1, further comprising the step of updating the PLL with the
carrier frequency offset estimate.
- 25 6. A method for use in a receiver, the method comprising:
running a carrier recovery loop in an open loop mode;
generating an estimate of a carrier frequency offset of a received signal from a phase
error signal of the carrier recovery loop;
updating an integrator of the carrier recovery loop with the estimate of the carrier
frequency offset; and
running the carrier recovery loop in a closed loop mode;
- 30 7. The method of claim 6, wherein the generating step includes the steps of:
determining a rollover count value for the phase error signal;
determining a symbol count value of the received signal; and

generating the carrier frequency offset estimate from the determined rollover count value and determined symbol count value.

8. A receiver comprising:

- 5 a carrier tracking loop (CTL) for processing a received signal; and
 a processor for estimating a carrier frequency offset as a function of a phase error signal of the CTL.

- 10 9. The receiver of claim 8, wherein the processor detects a false lock condition as a function of comparing the estimate of the carrier frequency offset to a closed loop value of the CTL.

10. A receiver comprising:

- 15 a carrier tracking loop (CTL) for processing a received signal; and
 a processor for (a) setting the CTL in an open loop mode of operation; (b) estimating a carrier frequency offset of the received signal as a function of a phase error signal of the CTL in the open loop mode of operation; (c) updating the CTL with the estimated carrier frequency offset; and (d) setting the CTL in a closed loop mode of operation.

- 20 11. The receiver of claim 10, wherein the CTL includes a rollover counter and a symbol counter accessible by the processor for use in estimating the carrier frequency offset.

12. The apparatus of claim 10, wherein the receiver is a set-top box.

- 25 13. An integrated circuit comprising:

 a carrier tracking loop (CTL) for processing a received signal; and
 at least one register for use in setting an operating mode of the CTL, wherein at least one operating mode of the CTL estimates a carrier frequency offset from a phase error signal of the CTL.

- 30 14. An integrated circuit comprising:

 an input lead for receiving a signal; and
 a carrier tracking loop (CTL) for use in generating an open loop estimate of a carrier frequency offset of the signal from a phase error signal of the CTL.

15. Apparatus comprising:

a complex multiplier for multiplying a receive signal having a carrier frequency with a recovered carrier for providing a derotated signal;

5 a phase error detector responsive to the derotated signal for providing a phase error signal representative of phase errors between the derorated signal and target symbols selected from a predefined symbol constellation;

a loop filter for filtering the phase error signal to provide a filtered signal;

an integrator for integrating the filtered signal to provide an integrated signal;

10 a sin/cos table responsive to the integrated signal for providing the recovered carrier; and

a processor for updating the integrator with a carrier frequency offset estimate as a function of the phase error signal.

15 16. The apparatus of claim 15, further comprising:

a rollover counter for counting a number of rollovers of the phase error signal; and

a symbol counter for counting a number of symbols in the derotated signal;

wherein the carrier frequency offset estimate is generated from the counted number of rollovers and the counted number of symbols.

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